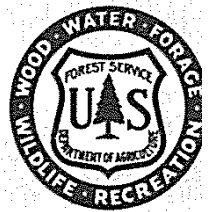


RESEARCH NOTE**CENTRAL STATES FOREST EXPERIMENT STATION
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HARVESTING COSTS AND RETURNS ON A MECHANIZED LOGGINGOPERATION IN SOUTHEAST KENTUCKY

Little published information is available showing costs on commercial logging operations in the Appalachians. Yet knowledge of costs is as basic to efficient logging as it is to any kind of business. This report examines saw log production and the associated costs and returns on a mechanized logging operation in southeast Kentucky. Such logging is generally new to eastern Kentucky.

A 9,000-pound-class rubber-tired logging tractor with articulated frame, and a knuckle-boom hydraulic loader mounted on a 2 1/2-ton tandem-axle truck were used on this operation. They were leased to a logging contractor by the Kentucky Farm Bureau Development Corporation under the sponsorship of the University of Kentucky. The lease required the contractor to maintain complete records of production, costs, and returns. The logging contractor, however, retained control over crew size, organization, and methods.

Terrain on the areas that were logged is rolling to steep and occasionally broken with cliffs. Volume of trees marked for harvest--predominantly oak--ranged from 1 to 2 thousand board feet per acre (International 1/4-inch rule) and the trees averaged 15 inches d.b.h. and one and one-half usable 16-foot logs.

The logging crew consisted of a feller-bucker, a choker-setter, a skidder operator, and a loader operator truckdriver. Marked trees were felled with a chain saw, limbed, and topped at the minimum saw log diameter. The

tractor winched and skidded tree-length logs--usually two--directly from the stump to a landing, normally about a 400-foot distance. At the landing, the tree-length logs were bucked into saw logs, loaded onto the truck by hydraulic loader, and hauled an average of 16 miles to the sawmill. Truckloads averaged 2,018 board feet (Doyle scale).

Records kept throughout the 26 weeks of operation show that the 4-man crew worked the equivalent of twenty-one 5-day weeks. During this time they produced 417.8 thousand board feet of saw logs (Doyle log rule), an average weekly production of 19.9 thousand board feet. Total logging costs were \$35.82 per thousand board feet. Equipment amounted to almost 40 percent of total cost; stumpage and labor expenditures were about evenly divided, each accounting for about 30 percent of the total (table 1). Hourly equipment costs (including operator) were \$2.16, \$4.82, and \$7.51 for chain saws, skidder, and the loader-equipped truck, respectively (table 2).

Labor cost per thousand board feet was highest in the skidding phase of the operation (table 3). Actually, little more than half of the effective production time (excluding unavoidable delay time) for the skidding phase was spent on skidding and return travel. Time studies indicate that 46 percent of the effective time was used hooking chokers, bunching tree lengths, and unhooking chokers. Moreover, skidding acted as pace setter for the entire operation. Although felling and limbing easily kept ahead of skidding, the feller only attempted to supply tree-length logs as needed, and loading and hauling was restricted to the pace set by the skidding.

Receipts amounted to \$40.00 per thousand board feet of saw logs harvested. Accordingly, the operation earned \$1,746 (before taxes) for the 6-month period--a margin of 10.5 percent. This margin, however, included more than profit-and-risk return to management. Typical of a small business of this type, the person controlling the enterprise and making the management decisions did not compensate himself directly for his management or supervisory time on this activity. Therefore, a portion of the business profit earned represents payment for this work.

Table 1.--Cost account for saw log harvest

(417.8 thousand board feet in 6 months)

Item	: Percent : of cost
Stumpage	29.4
Labor	
Base wages	25.2
Unemployment Insurance	1.0
Social Security	.9
Workmen's Compensation	4.1
Total labor	<u>31.2</u>
Equipment (fixed) ^{1/}	
Depreciation	16.1
Interest	2.8
Insurance	2.0
Registration and property tax	1.6
Rentals	.7
Total fixed	<u>23.2</u>
Equipment (variable)	
Gas (including highway tax)	7.9
Oil	.6
Maintenance	2.1
Replacement	5.6
Total variable	<u>16.2</u>
Total equipment cost	<u>39.4</u>
Total cost (\$14,963.71)	100.0

^{1/} Basis for depreciation:

	<u>Saws</u>	<u>Skidder</u>	<u>Truck & loader</u>
Original investment (I).. (2 saws)	\$590.00	\$11,547.00	\$12,744.40
Useful life, years (N)...	2	5	5
Trade-in value (R).....	0	0	0

6% x average profit-bearing capital at work in the
business, computed as:

$$APBC = \frac{(I-R)(N+1)}{2N} + R = \dots \$442.50 \quad \$6,928.20 \quad \$7,646.64$$

(assuming that depreciation allowances earn interest)

Table 2.--Equipment cost in dollars per hour

Type of cost	Chain saws	Rubber- tired : skidder	Truck with hydraulic : loader
Indirect cost:			
Depreciation (straight line) ^{1/}	0.18	1.50	2.12
Interest ^{2/}	.02	.27	.38
Insurance	--	.11	.40
Property tax	--	--	.04
Registration fee	--	--	.39
Total indirect	<u>.20</u>	<u>1.88</u>	<u>3.33</u>
Direct cost:			
Operating:			
Gas	.05	.48	^{3/} 1.41
Oil	.03	.06	.05
Maintenance	(^{4/})	.22	.29
Replacement	.02	.45	.89
Total	<u>.10</u>	<u>1.21</u>	<u>2.64</u>
Nonoperating:			
Labor ^{5/}	1.86	1.73	1.54
Total direct	<u>1.96</u>	<u>2.94</u>	<u>4.18</u>
Total cost per hour	2.16	4.82	7.51

^{1/} Basis for depreciation:			
	Saws	Skidder	Truck & loader
Original investment (I)...	\$590.00	\$11,547.00	\$12,744.40
(2 saws)			
Useful life, years (N)...	2	5	5
Trade-in value (R).....	0	0	0

^{2/} 6% x average profit-bearing capital at work in the business, computed as:

$$APBC = \frac{(I-R)(N+1)}{2N} + R = \dots \$442.50 \quad \$6,928.20 \quad \$7,646.64$$

(assuming that depreciation allowances earn interest)

^{3/} Includes highway tax.

^{4/} Included in labor cost.

^{5/} Includes Social Security, Workmen's Compensation, and Unemployment Insurance.

Table 3.--Cost account by saw log harvesting phase

Harvesting phase	Cost per thousand board feet	
	Dollars	Percent
Stumpage	10.52	29.4
Felling and bucking		
Labor	3.33	9.3
Equipment (fixed)	.36	1.0
Equipment (variable)	.18	.5
Total	<u>3.87</u>	<u>10.8</u>
Skidding		
Labor	5.50	15.4
Equipment (fixed)	3.24	9.0
Equipment (variable)	2.09	5.8
Total	<u>10.83</u>	<u>30.2</u>
Loading and hauling		
Labor	2.13	5.9
Equipment (fixed)	4.73	13.2
Equipment (variable)	3.54	9.9
Total	<u>10.40</u>	<u>29.0</u>
Road work	<u>.20</u>	<u>.6</u>
Total cost	35.82	100.0

Profit margins in the logging business are tied largely to rates of saw log production. In this case production could have been stepped up on the entire operation by increasing the production pace of the rubber-tired skidder through (1) locating landings to more fully use its designed load capacity and speed, and (2) reducing choking and bunching time. By this more efficient use of labor and equipment, production could have been increased about 25 percent (only 5 thousand board feet more per week), from 417.8 to 425 thousand board feet for the same 21 weeks. With this larger output the profit margin would have been 20.3 percent.^{1/} The manager would have had to spend more time planning and directing the work, but it would have more than doubled his return (fig. 1).

^{1/} With equipment variable costs projected at the same rate per thousand board feet and total fixed costs for labor and equipment unchanged.

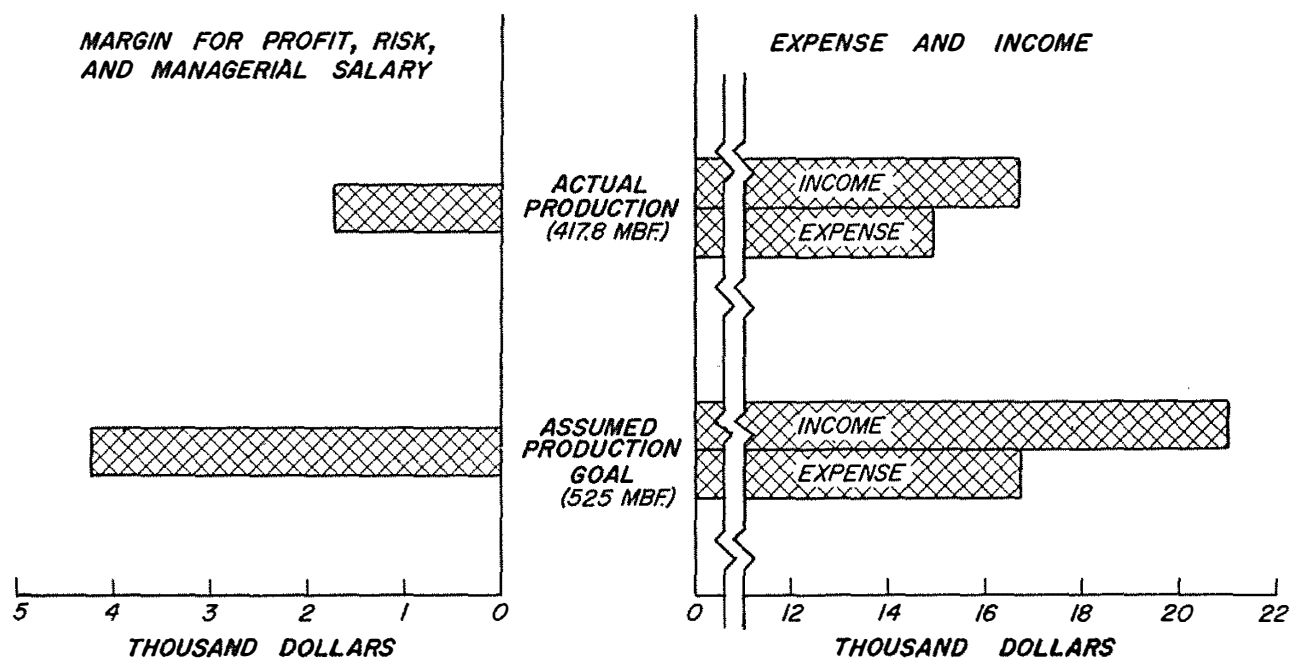


FIGURE 1.--Relation of actual expense and income from mechanized logging to predicted expense and income from more efficient operation during the 6-month period.

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